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GAI CONSULTANTS INC MONROEVILLE PA

NATIONAL DAM INSPECTION PROGRAM. BULL RUN DAM (NDI PA-463), OHI--ETC(U)

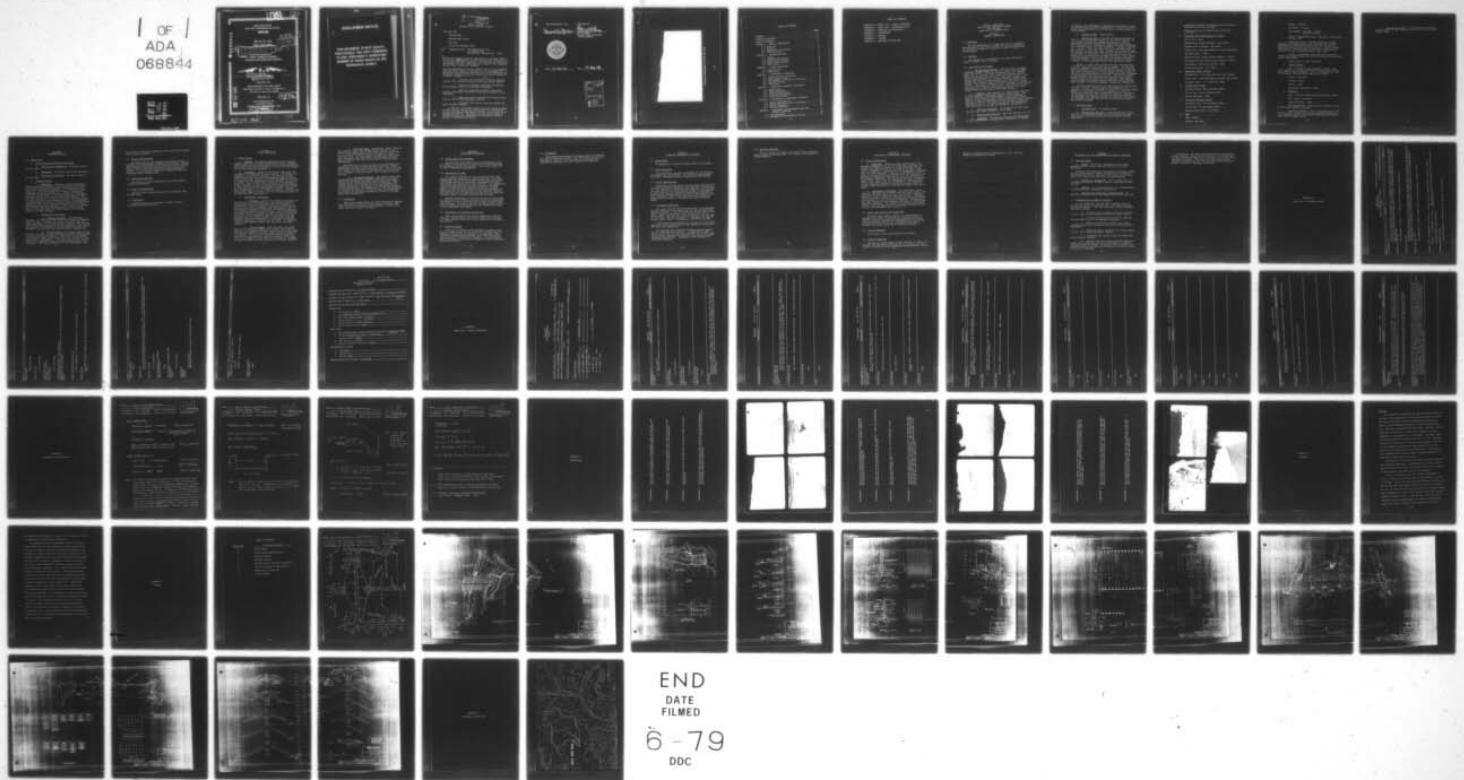
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OHIO RIVER BASIN
BULL RUN, WESTMORELAND COUNTY
PENNSYLVANIA

NDI No. Pa. - 463

BULL RUN DAM

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National Dam Inspection Program. Bull Run Dam (NDI PA-463), Ohio River Basin, Bull Run, Westmoreland County, Pennsylvania. Phase I Inspection Program.

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**PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM**

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PREPARED FOR

**DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203**

PREPARED BY

12/73P.

GAI CONSULTANTS, INC.
570 BEATTY ROAD
MONROEVILLE, PENNSYLVANIA 15146

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PHASE I REPORT
National Dam Inspection Program

Bull Run Dam

Pennsylvania

Westmoreland County

Bull Run

20 and 22 September 1978

Inspection Team - GAI Consultants, Inc.
570 Beatty Road
Monroeville, Pennsylvania 15146

Based on a visual inspection and review of available engineering data, the dam and its appurtenances are considered to be in good structural condition. The spillway is capable of discharging the flow resulting from a storm of PMF intensity and is, thus, considered adequate.

Required maintenance is poor, however, and it is recommended that the owner develop a program that will implement the procedures and operations provided for in the "Operation and Maintenance Manual." Specific items that require immediate attention include:

ABSTRACT

1. Clearing silt and debris currently obstructing the inlet end and possibly within the outlet conduit.
2. Clearing overgrowth from both the approach and discharge areas of the emergency spillway.
3. Removing overgrowth and soil cover which currently obstructs a portion of the rock toe drain of the embankment.
4. Repairing and/or replacing the riprap protection at the spillway-embankment contact.
5. Correcting the erosion occurring behind the right spillway wingwall.

In addition, the owners and/or operators should develop a formal warning system that provides for the notification of both upstream and downstream residents in the event of an emergency situation. The details of the system should be incorporated into the "Operation and Maintenance Manual," Section V, Emergency Operations.

GAI Consultants, Inc.

Approved by:

Bernard M. Mihalcin

Bernard M. Mihalcin, P.E.

G. K. Withers

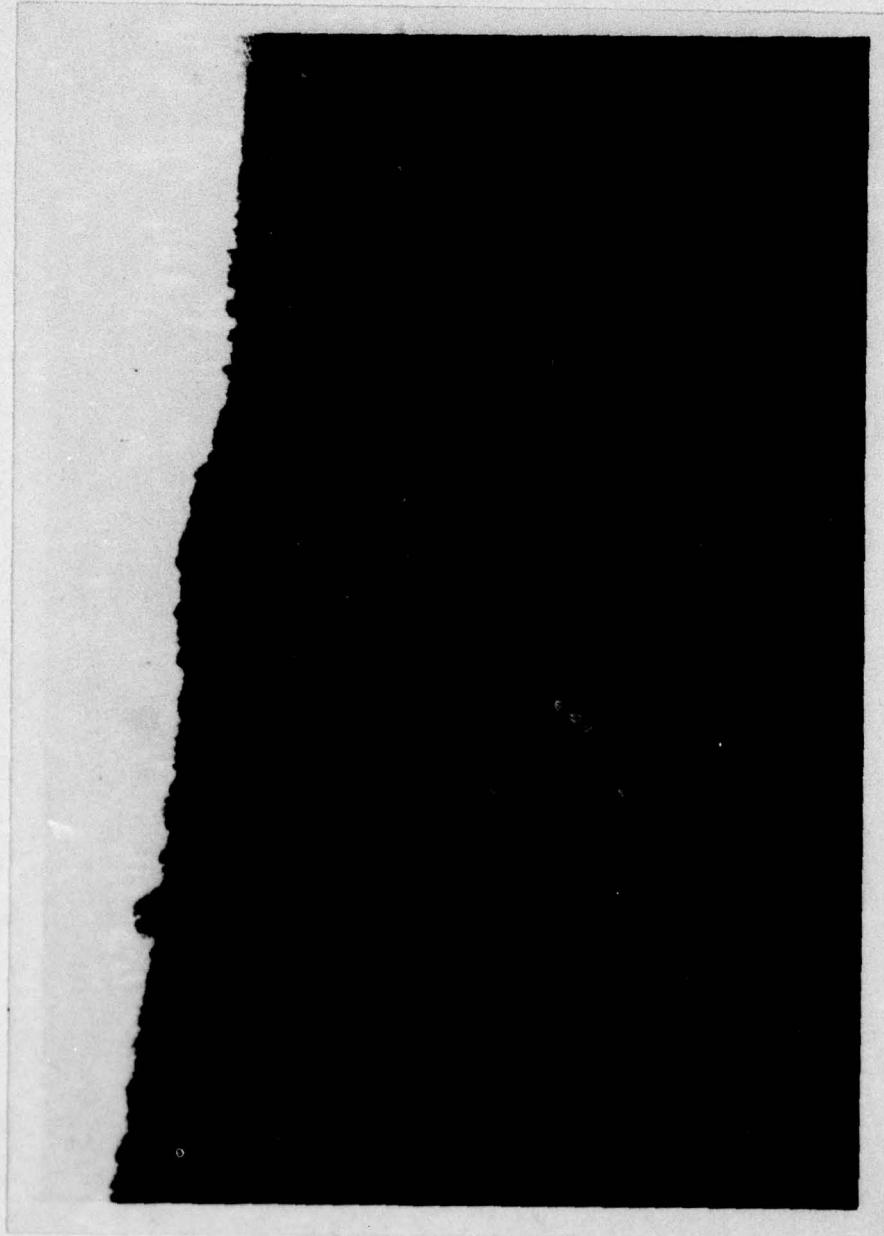
G. K. WITHERS
Colonel, Corps of Engineers
District Engineer



Date 21 Nov 78

Date 10 Dec 78

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Overview Photograph of Bull Run Dam

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PHASE I INSPECTION
NATIONAL DAM INSPECTION PROGRAM
BULL RUN DAM
NDI# PA-463, PENNDR# 65-89

SECTION 1
GENERAL INFORMATION

1.0 Authority

The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

1.1 Purpose.

The purpose is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

a. Dam and Appurtenances. Bull Run Dam is an earth embankment approximately 520 feet in length with a maximum height of 44 feet. The dam is operated as a dry impoundment, that is, without valve control and the rate of discharge is regulated by the size of the outlet conduit. The outlet works consists of a 48-inch diameter concrete pipe through the dam, an energy dissipator at the outlet of the culvert and a tubular steel trash rack at the inlet of the culvert. The inlet is ungated, but the entrance is constricted with a 24-inch diameter orifice pipe. The facility is also equipped with a concrete emergency spillway with an ogee-shaped crest cut into rock at the right abutment.

b. Location. Bull Run Dam is located across Bull Run in Penn Township, Westmoreland County, Pennsylvania. The City of Jeannette lies approximately 1 mile downstream (south) of the facility while Bushy Run Battlefield State Park is located approximately 3 miles upstream to the northeast. The dam, reservoir, and watershed are contained within the Greensburg U.S.G.S. 7.5-minute quadrangle (see Appendix G). The coordinates of the dam are N40°20'53" and W79°36'17".

c. Size Classification. Intermediate (44 feet high, 383 acre-feet total storage at top of dam).

d. Hazard Classification. High (see Section 3.1.c.4).

e. Ownership. The dam was designed and constructed by the Commonwealth of Pennsylvania, Department of Forests

and Waters (now Department of Environmental Resources) under an agreement with the City of Jeannette. Jeannette agreed to assume responsibilities for the operation and maintenance of this facility.

f. Purpose of Dam. Flood control.

g. Historical Data. Bull Run Dam was constructed in 1934. It was originally designed as the second (Dam No. 2) in a series of three dams whose purpose was to control floodwaters entering the Borough of Jeannette along Bull Run. This area had a history of floods resulting in substantial economic losses and undue hardships. Storage reservoirs No. 1 and No. 2 (Bull Run Dam) were to be located on the main stream 1/2 mile and 1 mile, respectively, upstream from the northern borough line while storage reservoir No. 3 was to be located on a tributary, 1/2 mile upstream of the line. These three reservoirs were designed to control flow through a 6-foot diameter culvert that diverted discharge beneath Jeannette Borough. No permits were ever issued for dams No. 1 and No. 3 and consequently they were never constructed.

Dam No. 2, known today as Bull Run Dam, was originally a 39-foot high structure, 520 feet in length. In 1957, the facility underwent significant modifications. The rehabilitation consisted of increasing the overall height of the dam five feet, construction of a new concrete spillway, adding a toe drain and improvements to the intake and outlet structures of the existing concrete pipe culvert. The work was deemed necessary after the flood resulting from Hurricane Hazel (1954) proved the spillway to be inadequate. The redesign was performed by PennDER engineers and the construction was done by Amber Construction Company, Greensburg, Pennsylvania.

Since the reconstruction the only deficiency consistently reported has been a general lack of maintenance at the facility. According to PennDER officials the current agreement between the State and the City of Jeannette is that the State will assume the major responsibilities and liabilities of ownership provided that the City of Jeannette provides the equipment and manpower necessary to maintain the facility in accordance with the "Operations and Maintenance Manual" developed by PennDER.

1.3 Pertinent Data.

a. Drainage Area. 1.1 square miles.

b. Discharge at Dam Site. Discharge and pool elevations are not recorded at this facility, therefore, there are no daily records available nor any record of maximum high water.

Outlet Works Conduit at Operating Pool Elevation -
Discharge curve not available.

Spillway capacity at maximum pool elevation ≈
5,000 cfs.

c. Elevation (feet above mean sea level).

Top of Dam - 1097.

Maximum Pool Design Surcharge - Not known.

Maximum Pool of Record - Not known.

Normal Pool - Dry impoundment; no pool maintained.

Spillway Crest - 1088.

Upstream Portal Invert Outlet Conduit - 1054.5.

Downstream Portal Invert Outlet Conduit - 1053.5.

Streambed at Centerline of Dam ≈ 1054.

Maximum Tailwater - Not known.

d. Reservoir Length (miles).

Maximum Pool ≈ 0.6 (elevation 1097 top of dam).

Normal Pool ≈ Dry impoundment; no pool maintained.

Spillway Crest ≈ 0.5 (elevation 1088).

e. Storage (acre-feet).

Spillway Crest ≈ 180 (elevation 1088).

Top of Dam ≈ 383 (elevation 1097).

Design Surcharge ≈ 203.

f. Reservoir Surface (acres).

Spillway Crest ≈ 20 (elevation 1088).

Top of Dam ≈ 25 (elevation 1097).

Maximum Design Pool - Not known.

g. Dam.

Type - Earth.

Length ≈ 520 feet.

Height \approx 44 feet.

Top Width - 20 feet.

Side Slopes - Upstream 2H:1V
Downstream 2H:1V.

Zoning - Homogeneous earth. Toe drain from Station 1+78 to 3+50.

Impervious Core - Available records including numerous construction photographs indicate the original embankment was constructed with a core wall of concrete blocks filled and faced with concrete on a concrete foundation under the upstream edge of the crest. Photographs indicate the wall is approximately 2 feet thick.

Cutoff - Available records indicate a concrete cutoff wall extends below the core wall to impervious material in the substratum.

Grout Curtain - None indicated.

h. Outlet Conduit.

Type - Ungated 48-inch diameter concrete, low-level conduit with intake located at the upstream toe near the center of the embankment. Flow is controlled by a 24-inch diameter orifice pipe at the culvert inlet.

Length \approx 168 feet.

Closure - None.

Access - None.

Regulating Facilities - None.

i. Spillway.

Type - Concrete channel with ogee-shaped crest.

Weir Length - 50 feet.

Crest Elevation - 1088.

Upstream Channel - Short natural channel cut out of the right abutment hillside.

Downstream Channel - Flow is discharged over the spillway crest through the concrete channel and over the right abutment hillside beyond the embankment toe where it enters the streambed below.

j. Regulating Outlets. 48-inch diameter concrete conduit with a 24-inch diameter constricted (orifice pipe) inlet opening.

SECTION 2
ENGINEERING DATA

2.1 Design Data.

a. Design Data Availability and Sources.

1. Hydrology and Hydraulics. No design reports are available.

2. Embankment. No design reports are available.

3. Appurtenant Structures. No design reports are available.

b. Design Features.

1. Embankment. Numerous construction photographs and design drawings of the original facility dated 1934 along with design drawings of the present facility dated 1957 indicate the embankment is a homogeneous earth structure. Along the length of its base, a trench was excavated and the foundation for a concrete and concrete block core wall placed. A concrete cutoff wall reportedly extends below the core wall to impervious material. The core wall foundation is reported to consist of shale at the ends and blue clay in the central section. The embankment is constructed with 2H to 1V slopes on both the upstream and downstream faces while the crest measures 20 feet across (see Figures 6 and 8, Appendix F). A toe drain is provided on the downstream slope between Stations 1+78 and 3+50. There are no provisions for seepage control from Station 3+50 to the right abutment.

2. Appurtenant Structures.

a) Emergency Spillway. The emergency spillway is a concrete channel type 50 feet wide and approximately 80 feet in length. It is cut into rock along the right abutment. The drawings indicate concrete keys to have been constructed at both ends of the structure. Flow through the spillway is controlled by an ogee-shaped concrete weir located at its entrance (see Figures 3 and 4, Appendix F).

b) Outlet Conduit. The outlet works at the facility consists of a 48-inch diameter concrete pipe through the dam, an energy dissipator at the outlet of the culvert, and a tubular steel trash rack at the inlet of the culvert (see Figure 5, Appendix F). The culvert is ungated, but the entrance is constricted with a 24-inch diameter inlet (orifice pipe). The dam is operated as a dry impoundment with

the amount of discharge regulated by the size of the ungated outlet conduit opening.

2.2 Construction Records.

No records of the 1957 construction of the present facility aside from design drawings are available. Records pertaining to construction of the original facility include design drawings, pre-construction and construction photographs. This information along with various memoranda relative to construction progress at different stages are contained within PennDER files.

2.3 Operational Records.

The facility is self-regulating and no operational records are available.

2.4 Other Investigations.

Several state inspection reports are available from PennDER files.

2.5 Evaluation.

Sufficient data were available to make a Phase I assessment of the facilities.

SECTION 3
VISUAL INSPECTION

3.1 Observations.

a. General. The general appearance of the facility suggests that it is in good structural condition. Observations noted during the inspection indicate those deficiencies that do exist are related primarily to a lack of maintenance and require immediate attention.

b. Embankment. Based on the visual inspection, the embankment is considered in good condition. No evidence of sloughing or erosion was observed. No evidence of past seepage during periods when the embankment impounded water could be detected. Since no water was impounded at the time of inspection, the performance of the dam could not be fully evaluated. The crest was well aligned and the embankment slopes consistent. Lack of regular maintenance was obvious in that both the upstream and downstream slopes were covered by dense vegetation (see Photographs 1 and 10). Several small maple trees (1.0 to 1.5 feet in diameter) were observed growing from stumps of older trees near the left wingwall of the spillway (see Photograph 9).

c. Appurtenant Structures.

1. Spillway. The visual inspection revealed the spillway to be in fair condition. The concrete was relatively unmarred and displayed few signs of weathering. Nevertheless, both the approach and discharge areas of the spillway were heavily overgrown (see Photographs 5 and 6). The excessive overgrowth could have a significant effect on the discharge capacity of the spillway. Other deficiencies associated with the spillway are that the riprap protecting the corner of the embankment near the junction of the embankment and left spillway wingwall just upstream of the spillway crest (see Photograph 5) is displaced, affording somewhat inadequate protection for the slope. In addition, there is some erosion evident near the top of the right wingwall.

2. Outlet Conduit. Both the inlet and outlet ends of the discharge conduit were visible during the inspection. The concrete surfaces associated with these areas were in good condition with only minor patches of spalling in evidence. The inlet was found to be near totally obstructed (see Photograph 3) with approximately three quarters of the conduit covered with silt and debris. Evidence of minor siltation was also observed in the outlet channel.

3. Reservoir Area. Photograph 7 shows a view of the reservoir area. The stream channel located in the center of the photograph is partially hidden by the thick, 4- to 5-foot high vegetation that typifies the entire reservoir area. No large trees were observed in the reservoir indicating that some effort has been made over the years to maintain the area and to keep it clear of major obstructions.

Approximately 1/4 mile upstream of the embankment two residences are located along the east shoreline. Field measurements indicate both residences and in particular the one closest to the reservoir are sufficiently low to be partially inundated if the pool level rises to near the top of the dam.

4. Downstream Channel. The channel downstream of the embankment passes alongside both heavy and light industries and small residential areas before it enters a conduit on the outskirts of the City of Jeannette. The conduit diverts flow beneath the city and discharges it further downstream. The extent of the development within the flood plain below the embankment is more than sufficient to classify the facility a "high" hazard. The downstream population that could be effected by a breach of the dam would easily exceed 100.

3.2 Evaluation.

Observations made during the visual inspection suggests that the overall condition of the facility is good. The major deficiencies found are due primarily to poor maintenance and can be readily rectified.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Normal Operating Procedure.

The facility is designed to be self-regulating, that is, inflow is discharged in accordance with the capacities of the outlet conduit and spillway. As a result there are no normal operational procedures.

4.2 Maintenance of Dam.

The present condition of the facility suggests that little regular maintenance is being performed. Mr. Jack M. Hugendubler who serves as an inspector of state-owned dams for PennDER, Bureau of Operations, accompanied the field team during its inspection of this facility. Mr. Hugendubler stated that the facility has had a history of problems generally associated with determining who is its legal owner. He told the field team that the state accepted the responsibility of ownership back in the mid-1960's contingent upon the City of Jeannette providing the equipment and manpower needed to properly maintain the facility.

Regular maintenance of the facility is to be performed in accordance with a manual entitled "Operation and Maintenance Manual for Bull Run Flood Control Dam" available from PennDER files. The manual contains information and instructions regarding routine maintenance and inspection as well as flood emergency procedures.

4.3 Maintenance of Operating Facilities.

There are no mechanical systems associated with this facility. Maintenance of the outlet conduit and spillway are detailed within the text of the "Operation and Maintenance Manual."

4.4 Warning Systems.

There are no formal warning systems in effect at the facility that provide for the protection of downstream (or upstream) inhabitants in the case of an emergency. The "Operation and Maintenance Manual" does cover extensively the procedures to follow with regards to the dam during a flood event and likely could be adapted to include emergency warning procedures.

4.5 Evaluation.

Observations made during the visual inspection indicate that the provisions outlined in the "Operations and Maintenance Manual" have been loosely adhered to and that the facility is presently in a poorly maintained condition.

SECTION 5
HYDROLOGIC/HYDRAULIC EVALUATION

5.1 Design Data.

No hydrologic or hydraulic design data are available.

5.2 Experience Data.

Data relative to the past performance of the facility are minimal and inconclusive. All observed appurtenances are intact indicating probable adequate past performance.

5.3 Visual Observations.

Conditions observed during the inspection indicate that the outlet conduit or emergency spillway could not function with the efficiency intended by their designs. Specifically, the inlet end of the outlet conduit (shown in Photograph 3) is obstructed and the approach and discharge areas associated with the emergency spillway shown in Photographs 5 and 6 are overgrown. None of the above-mentioned conditions should exist according to the Operation and Maintenance Manual.

5.4 Overtopping Potential.

The ratio "PMF Peak Flow/Drainage Area" was determined from an empirical curve supplied by the Corps of Engineers, Baltimore District. The curve used was the Ohio River Basin Curve. Based on this curve and a drainage area of 1.1 square miles, Peak PMF Q/A = 1950 cfs/sq. mi., and Peak PMF Q = 2145 cfs. The size category is "intermediate" and the hazard rating "high". Consequently, the SDF is the PMF.

Calculations were performed to evaluate the overtopping potential using spillway and storage capacities during the PMF event (see Appendix C).

The spillway has a maximum discharge capacity equivalent to approximately 5,000 cfs. A comparison of peak inflow (2,145 cfs) with maximum discharge (5,036 cfs) shows the discharge capacity to be greater than the peak inflow resulting from the PMF. Consequently, the spillway is considered adequate.

5.5 Spillway Adequacy.

The facility will discharge the peak inflow resulting from a storm of PMF magnitude. As a result, the spillway is deemed adequate.

SECTION 6
EVALUATION OF STRUCTURAL INTEGRITY

6.1 Visual Observations.

a. Embankment. Based on visual observations, the embankment appears to be in good structural condition. No evidence of seepage, erosion, or crest settlement was observed, although there was no pool behind the dam at the time of inspection. Maintenance of the embankment, nevertheless, has been neglected. The lack of maintenance is contrary to the procedures and objectives of the "Operation and Maintenance Manual" prepared for the City of Jeannette by the designer (PennDER). The manual specifically recommends, among other things, that the embankment be mowed at least twice a year (spring and fall preferably). The appearance of the vegetation presently covering the slopes seems to indicate that this policy is not being carried out as specified.

b. Appurtenant Structures. The appurtenant structures of this facility including both the outlet conduit and emergency spillway appear to be in good overall condition. Only minor areas of concrete deterioration were observed on either structure. These are presently considered insignificant relative to their structural integrity. Erosion along the right wingwall of the emergency spillway is evident and should be rectified. The conduit and spillway both suffer, however, from the same neglect and lack of maintenance that afflicts the embankment (see Section 5.3).

6.2 Design and Construction Techniques.

No design data, design reports, or computations are available for either the present or original facility. A limited amount of construction photographs and memoranda along with design drawings are available pertaining to the original facility but are not considered sufficient to evaluate the actual construction techniques applied.

6.3 Past Performance.

No records of past performance are available.

6.4 Seismic Stability.

The dam is located within Seismic Zone No. 1, and it is thought that the static stability of the structure is sufficient to withstand minor earthquake-induced dynamic forces.

However, no calculations, investigations, etc., were performed to confirm this opinion.

Однако же никаких, лишь бы «важных»,
всех ли же возможных и надежных вычислений
было бы выполнено значительно быстрее.
Но придется же упомянуть об этом, так как
такие же вычисления были бы выполнены
всего лишь вдвое дольше, а не втройне.
Все же это неизбежно, так как в этом случае
все же придется учесть все возможные
варианты, а не только те, которые
имеют место в реальных условиях.

Итак, вычисления, о которых идет речь в настоящем
отчете, это не просто вычисление для каких-то
одинаковых условий, а это вычисление для
одинаковых условий, но для различных
параметров, для которых вычисление
будет производиться в зависимости от
значения какого-либо параметра, а не от
одного параметра. Для этого необходимо
иметь в виду, что для каждого из
параметров, для которого производится
вычисление, необходимо учесть
все возможные варианты, а не
только те, которые имеются в
реальных условиях.

SECTION 7
ASSESSMENT AND RECOMMENDATIONS FOR REMEDIAL MEASURES

7.1 Dam Assessment.

a. Safety. The visual inspection and available engineering data suggest that the facility is in good condition.

Hydraulic and hydrologic calculations performed as part of this investigation indicate the facility is capable of discharging the inflow resulting from a storm of PMF magnitude. As a result, the spillway is deemed adequate.

b. Adequacy of Information. The available data are considered sufficient to make a Phase I assessment of the facility.

c. Urgency. It is suggested that the recommendations indicated below be implemented immediately.

d. Necessity for Additional Investigations. No additional investigations are deemed necessary at this time.

7.2 Recommendations/Remedial Measures.

It is recommended that the owner implement the procedures and operations provided for in the "Operation and Maintenance Manual." Specific items that require immediate attention include:

1. Clearing silt and debris currently obstructing the inlet end and possibly within the outlet conduit.

2. Clearing overgrowth from both the approach and discharge areas of the emergency spillway.

3. Removing overgrowth and soil cover which currently obstructs a portion of the rock toe drain of the embankment.

4. Repairing and/or replacing the riprap protection at the spillway-embankment contact.

5. Correcting the erosion occurring behind the right spillway wingwall.

6. The dam should be inspected during high peak levels (as suggested by the operations manual) to detect possible areas of seepage. If any are found to exist, the condition should be evaluated to determine its effect on the intergrity of the dam.

In addition, the owner and/or operators should develop a formal warning system that provides for the notification of both upstream and downstream residents in the event of an emergency situation. The details of the warning system should be incorporated into the "Operation and Maintenance Manual," Section V, Emergency Operations.

APPENDIX A
CHECK LIST - ENGINEERING DATA

CHECK LIST	NAME OF DAM	Bull Run Dam
ENGINEERING DATA		
DESIGN, CONSTRUCTION, OPERATION	ID # NDI #PA-463, PennDER #65-89	
PHASE I		
ITEM:	REMARKS	

AS-BUILT DRAWINGS

Drawings of the original facility by J. R. Daugherty, B.S.S.E. (Sanitary Engineer) dated circa 1934 (several dates including many revisions) along with drawings of the present facility by the Pennsylvania Department of Forests and Waters dated 1957 are available from PennDER.

See Appendix G (U.S.G.S. 7.5 minute series, Greensburg Quadrangle)

CONSTRUCTION HISTORY

Photographs along with various correspondence and memoranda pertaining to the construction of the original facility are contained within PennDER files. Only a limited amount of correspondence is available in these same files that pertains to the reconstruction.

TYPICAL SECTIONS OF DAM

See Appendix F, Figure 8 (DWG C65.5-1.9 "Cross Sections," dated 7/7/57)

- OUTLETS - PLAN See Appendix F, Figure 1 (DWG C65-5-1.1, "General Plan," revised 7/19/57)
- DETAILS See Appendix F, Figure 5 (DWG C65-5-1.6, "Stilling Basin and Outlet Structure," revised 7/19/57)
- DISCHARGE RATINGS None available.

RAINFALL/RESERVOIR RECORDS

Rainfall/Reservoirs records are not kept for this facility.

ITEM	REMARKS	ID #NDI#PA-463	HEET 2
DESIGN REPORTS	None available.		
GEOLOGY REPORTS	None available.		
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES			
MATERIALS INVESTIGATIONS BORING RECORDS See Figure 7; Test Pit Data for the original dam available in PennDER files. LABORATORY None available. FIELD	None available.		
POST-CONSTRUCTION SURVEYS OF DAM			
BORROW SOURCES	Survey performed on the old dam prior to rehabilitation.		Available records indicate the borrow materials to have been taken from within the reservoir area.

ITEM	REMARKS	ID # NDI#PA-463	SHEET 3
MONITORING SYSTEMS			
	None.		
MODIFICATIONS			
	The facility was partially reconstructed in 1957. The only pertinent engineering data available are "As-built" and "Design" drawings contained within PennDER files.		
HIGH POOL RECORDS			
	None available.		
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS			
	None.		
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS			
	None available.		
Maintenance Operation Records			
	None available. Maintenance manual available from PennDER files.		

ITEM	REMARKS	ID # NDI#PA-463	SHEET 4
SPILLWAY PLAN	See Appendix F, Figure 3		
SECTIONS			
DETAILS	See Appendix F, Figure 4		

OPERATING EQUIPMENT
PLANS & DETAILS

None.

NDI #PA-463

CHECK LIST ID # PennDER #65-89
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 1.1 square miles.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): Dry reservoir, no pool maintained.

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 180 ac-ft (EL 1088 spillway crest)

ELEVATION MAXIMUM DESIGN POOL: Not known.

ELEVATION TOP DAM: 383 ac-ft (EL 1097).

SPILLWAY DATA:

- a. Crest Elevation 1088.
- b. Type Concrete channel with ogee-shaped crest.
- c. Weir Length Crest length 50 feet.
- d. Channel Length 80 feet.
- e. Location Spillover Right abutment.
- f. Number and Type of Gates None.

OUTLET WORKS:

- a. Type Ungated 48"φ concrete conduit with 24"φ constricted inlet opening.
- b. Location Approximate center of embankment.
- c. Entrance Inverts 1054.5
- d. Exit Inverts 1053.5
- e. Emergency Draindown Facilities Same.

HYDROMETEOROLOGICAL GAGES:

- a. Type None.
- b. Location -
- c. Records None.

MAXIMUM NON-DAMAGING DISCHARGE: Not known.

APPENDIX B
CHECK LIST - VISUAL INSPECTION

CHECK LIST
VISUAL INSPECTION
PHASE 1

DAM NAME Bull Run Dam COUNTY Westmoreland STATE PA NDI # PA-463
TYPE OF DAM Rolled earth HAZARD CATEGORY High ID # PennDER #65-89
DATE (S) INSPECTION September 20 & 22 WEATHER Partly Cloudy TEMPERATURE 80 °F
1978

POOL ELEVATION AT TIME OF INSPECTION DRY M.S.L. TAILWATER AT TIME OF INSPECTION 1053.8 M.S.L.

INSPECTION PERSONNEL:

20 September 1978	<u>J. Hugendubler (DER)</u>
D. L. Bonk (GAI)	
S. R. Michalski (GAI)	
R. E. Gray (GAI)	<u>D. L. Bonk</u> RECORDER
3 October 1978	
B. M. Mihalcin (GAI)	
J. P. Nairn (GAI)	

JUL EXAMINATION OF OBSERVATIONS REMARKS OR RECOMMENDATIONS

FACE CRACKS

1. None visible.
2. Embankment completely overgrown with weed-like vegetation.

SUL MOVEMENT OR
CKING AT OR BEYOND
TOE

None observed.

UGHING OR EROSION OF
ANKMENT AND ABUTMENT
PES

None observed.

TICAL AND HORIZONTAL
IMENT OF THE CREST

Good.

RAP FAILURES

No riprap on embankment slopes. The only riprap associated with this structure is designed to protect the upstream right corner of the embankment at the spillway-embankment junction. The riprap has been partially dislodged from the embankment in this area.

EMBANKMENT ID # NDI #PA-463

SHEET 2

VISUAL EXAMINATION OF

OBSERVATIONS

REMARKS OR RECOMMENDATIONS

FUNCTION OF EMBANKMENT
AND ABUTMENT, SPILLWAY
AND DAM

Left abutment junction with embankment is in good condition. Right side embankment junction with left spillway wingwall in good condition. Right abutment junction with right spillway wingwall has separated and requires some repair.

ANY NOTICEABLE SEEPAGE

None observed. Reservoir empty during inspection. No evidence of past seepage noted.

STAFF GAGE AND RECORDER

None.

RAINS

None.

SPECIAL EXAMINATION OF
LEAKING AND SPALLING OF
CONCRETE SURFACES IN
OUTLET CONDUIT

Minor isolated areas of spalling and scaling were observed on some of the exposed surfaces. Not viewed as significant.

OUTLET STRUCTURE

Outlet pipe blocked by silt and debris at the inlet.

OUTLET CHANNEL

Good condition.

Unobstructed. Evidence of minor silting viewed immediately downstream of the culvert outlet.

EMERGENCY GATE

None.

UNGATED SPILLWAY

ID # NDI #PA-463

SHEET 4

VISUAL EXAMINATION OF

CONCRETE WEIR

Good condition. Minor cracking and scaling observed. The weir is partially obstructed by vegetation along the right side of the forebay where no concrete apron protects the approach. Needs cleared.

APPROACH CHANNEL

1. Riprap slope protection thrown into the approach channel by vandals. Needs cleared.
2. Some debris and vegetation.

DISCHARGE CHANNEL

Moderately overgrown with trees and brush. Needs cleared.

RIDGE AND PIERS

None.

SHEET 5

GATED SPILLWAY

CONCRETE SILL

BRIDGE AND PIERS

VISUAL EXAMINATION OF

APPROACH CHANNEL

OBSERVATIONS

GATES AND OPERATION

EQUIPMENT

DISCHARGE CHANNEL

N/A

N/A

BRIDGE AND PIERS

N/A

GATES AND OPERATION

EQUIPMENT

N/A

REMARKS OR RECOMMENDATIONS

N/A

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None.	
OBSERVATION WELLS	None.	
WEIRS	None.	
PIEZOMETERS	None.	
OTHERS	None.	

RESERVOIR ID # NDI PA#-463 SHEET 7

USUAL EXAMINATION OF OBSERVATIONS REMARKS OR RECOMMENDATIONS

LOPES

Moderate to steep side slopes, heavily vegetated on the east. Farm and pasture land on the north and west.

EDIMENTATION

None other than siltation at inlet structure.

SHEET 8

ID #

DOWNSTREAM CHANNEL

USUAL EXAMINATION OF CONDITION	OBSTRUCTIONS, (OBSTRUCTIONS, DEBRIS, ETC.)	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
LOPES	The downstream channel follows a near straight path on its route to the conduit that will divert its flow beneath the City of Jeannette. Along the route the stream passes through a well developed urban valley and is twice spanned by township roads before reaching the diversion conduit.	The downstream channel is surrounded by sparsely wooded farmland with moderate slopes that become increasingly urbanized as the stream approaches the city.	

APPROXIMATE NO. 4	Approximately 1/4 mile upstream of the embankment two residences are located along the east shoreline. Field measurements indicate both residences and in particular, the one closest the reservoir are sufficiently low to be partially inundated if the pool level rises to near the top of the dam. The City of Jeannette lies approximately 1 mile downstream of the embankment. Its population is estimated by the Department of the Interior at approximately 16,300 persons. It is likely that a fair percentage of this population would be affected by an embankment breach.
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APPENDIX C
HYDROLOGY AND HYDRAULICS

SUBJECT DAM SAFETY INSPECTION
BULL RUN DAM
BY DLB DATE 9-22-78 PROJ. NO. 28-501-463
CHKD. BY EJM DATE 10-18-78 SHEET NO. 1 OF 4



DAM STATISTICS

MAXIMUM HEIGHT - 44 FEET (FIELD MEASURED)

DRAINAGE AREA - 1.1 SQ. MI. [PLANIMETERED OFF U.S.G.S.
GREENSBURG QUADRANGLE,
7.5 MINUTE SERIES]

STORAGE CAPACITY -

@ SPILLWAY CREST (EL 1088) \approx 180 ACRE- FEET (SEE NOTE AT BOTTOM)
@ Top of DAM (EL 1097) \approx 383 ACRE- FEET " " "

SIZE CLASSIFICATION

DAM SIZE - INTERMEDIATE

(REF Z: TABLE 1)

HAZARD RATING - HIGH

(FIELD OBSERVATION
REF Z: TABLE 2)

REQUIRED SDF - PMF

(REF Z: TABLE 3)

NOTE: THE VALUE FOR STORAGE CAPACITY AT NORMAL POOL HAS BEEN TAKEN FROM PAGE 97 OF REFERENCE 1. VERIFICATION HAS BEEN MADE UTILIZING THE FORMULA FOR DETERMINING STORAGE CAPACITIES RECOMMENDED BY U.S. ARMY CORPS OF ENGINEERS, PITTSBURGH DISTRICT; THAT IS, $\frac{1}{3}$ (RESERVOIR AREA)(HEIGHT) = STORAGE. THE RESERVOIR AREA (@ NORMAL POOL) WAS PLANIMETERED OFF FIG. 7, APPENDIX F. TOP OF DAM STORAGE IS BASED ON RESERVOIR AREA AT NORMAL POOL OF 20 ACRES AND AT TOP OF DAM OF 25 ACRES (PLANIMETERED OFF U.S.G.S. 7.5 MINUTE SERIES, GREENSBURG QUADRANGLE). AVAILABLE FREEBOARD IS 9 FEET (SHEET Z). $[(25+20)/2](?) = 203 \text{ AC-FT} = \text{SURCHARGE STORAGE}$, $180 \text{ AC-FT} (\text{NORMAL POOL}) + 203 (\text{SURCHARGE}) = 383 \text{ AC-FT} (\text{TOTAL STORAGE})$

SUBJECT DAM SAFETY INSPECTION
BULL RUN DAM
BY DLB DATE 9-22-78 PROJ. NO. 78-501-463
CHKD. BY EIM DATE 10-13-78 SHEET NO. 2 OF 4



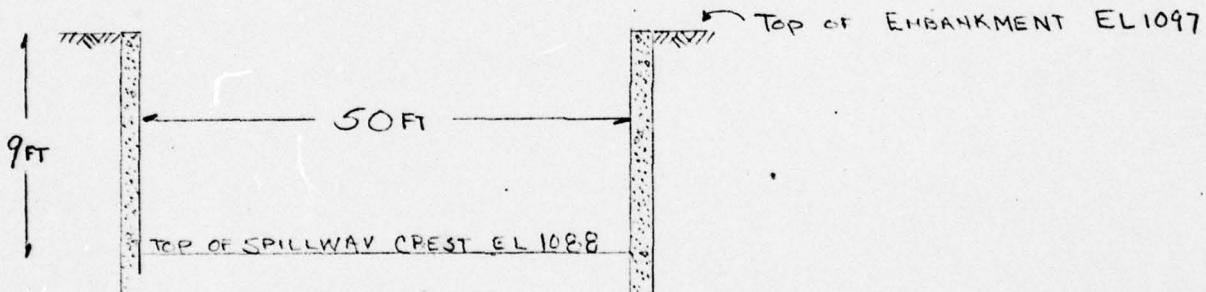
PMF (PEAK FLOW) / AREA = 1950 CFS / SQ. MI.

(REF: COF E CURVE,
OHIO RIVER BASIN)

$$\text{PMF} = (1950 \text{ cfs/sq. mi.})(1.1 \text{ sq. mi.}) = 2145 \text{ cfs}$$

$$\text{PEAK PMF } Q = 2145 \text{ cfs} = Q_{\text{IMAX}}$$

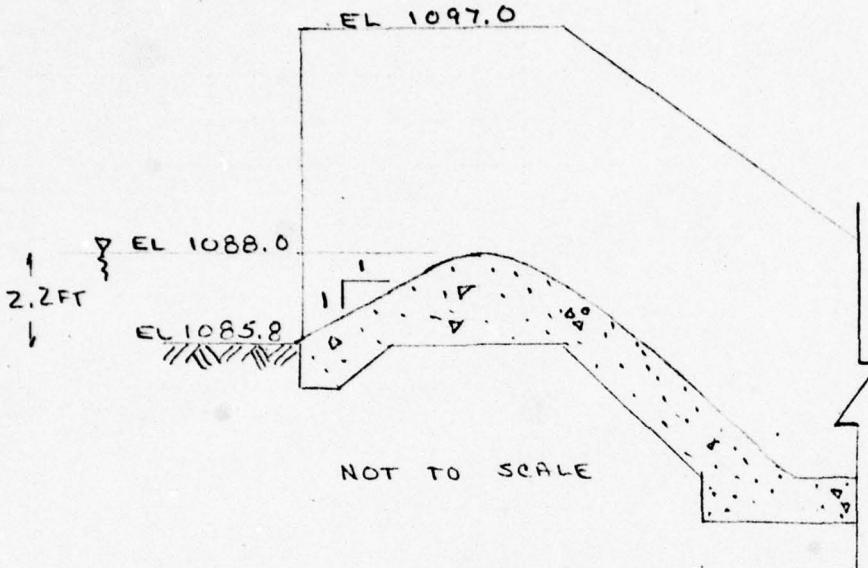
SPILLWAY CAPACITY



NOTE: ALL ELEVATIONS ARE TAKEN FROM DESIGN DRAWINGS
PREPARED BY THE PENNSYLVANIA DEPT OF FORESTS AND
WATERS AND 7-19-57. (REF DRWG NO C65:5-1.3).
DIMENSIONS ARE FIELD VERIFIED.

SUBJECT DAM SAFETY INSPECTION
BULL RUN DAM
 BY DLB DATE 9-22-78 PROJ. NO. 78-501-463
 CHKD. BY EJM DATE 10-18-78 SHEET NO. 3 OF 4

gbi
 CONSULTANTS, INC.
 Engineers • Geologists • Planners
 Environmental Specialists



REF: CREST DETAIL
 DRAWING NO.
 C65:5-1.3
 By PA. DEPT. OF
 FORESTS AND WATERS
 DATED 7-19-57

$$Q = C L H^{3/2}$$

L = LENGTH OF SPILLWAY CREST = 50 FT

$$H = \text{MAXIMUM HEAD OVER SPILLWAY CREST} = \\ (1097.0 - 1088.0) = 9 \text{ FT}$$

(REF 3: EQ 21-121)

(SHEET 2, SKETCH)

C = COEFFICIENT OF DISCHARGE

(FROM REF 3: FIGURE 21-69 COMES THE FOLLOWING)

P/Hd = FOREBAY DEPTH / MAXIMUM HEAD

$$= 2.2 \text{ FT} / 9.0 \text{ FT} = 0.24$$

(SEE FIGURE ABOVE)

SUBJECT DAM SAFETY INSPECTION
BULL RUN DAM
BY DLB DATE 9-22-78 PROJ. NO. 78-501-463
CHKD. BY EJM DATE 10-18-78 SHEET NO. 4 OF 4



C INCLINED \approx 1.03

C VERTICAL

(FROM REF 3: FIGURE 21-67)

C VERTICAL \approx 3.62

C INCLINED \approx (1.03)(3.62) \approx 3.73

$$Q = (3.73)(50\text{ft})(9\text{ft})^{3/2} = 5036 \text{ cfs}$$

PEAK PMF Q (2145 cfs) < MAXIMUM DISCHARGE (5036 cfs)

REFERENCES

- 1 : "WATER RESOURCES BULLETIN; DAMS, RESERVOIRS AND LAKES"
PENNA, DEPT. OF FORESTS AND WATERS; BULLETIN NO. 5, COMPREHENSIVE
WATER RESOURCES PLANNING INVENTORY NO. 1, 1970
- 2 : "RECOMMENDED GUIDELINES FOR SAFETY INSPECTIONS OF DAMS"
DEPT OF THE ARMY - OFFICE OF CHIEF ENGINEER, APPENDIX D
- 3 : STANDARD HANDBOOK FOR CIVIL ENGINEERS
F. S. MERRIT, McGRAW-HILL 1976

APPENDIX D
PHOTOGRAPHS

APPENDIX D
PHOTOGRAPHS
CONTAINS 100 PHOTOGRAPHS
ARRANGED IN 10 GROUPS
GROUP 1: 10 PHOTOS OF THE
INTERIOR OF THE
LABORATORY

APPENDIX D
PHOTOGRAPHS
CONTAINS 100 PHOTOGRAPHS
ARRANGED IN 10 GROUPS
GROUP 2: 10 PHOTOS OF THE
INTERIOR OF THE
LABORATORY

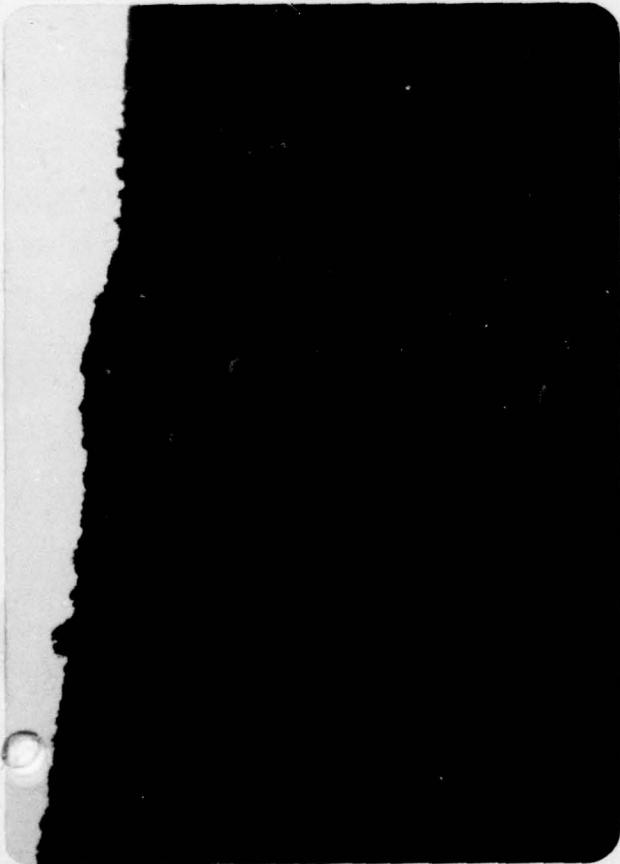
APPENDIX D
PHOTOGRAPHS
CONTAINS 100 PHOTOGRAPHS
ARRANGED IN 10 GROUPS
GROUP 3: 10 PHOTOS OF THE
INTERIOR OF THE
LABORATORY

PHOTOGRAPH 1 View looking southeast at the upstream slope of the dam. The heavy growth of vegetation completely obscures the ground.

PHOTOGRAPH 2 Detail view showing the trashrack which protects the 24-inch inlet pipe. Note the floatsom on top of the trashrack.

PHOTOGRAPH 3 Detailed view showing the partially obstructed inlet end of the outlet pipe.

PHOTOGRAPH 4 This detailed view shows the outlet wingwalls and 48-inch diameter outlet pipe. Note the concrete weir in the foreground and provisions for externally mounted sluice gate.



4

3

PHOTOGRAPH 5 This view is looking downstream (southeast) across the approach channel to the emergency spillway. Riprap and other debris in the spillway is due to vandalism.

PHOTOGRAPH 6 Detailed view of the outlet end of the spillway. Note the encroachment of trees both below and within the spillway.

PHOTOGRAPH 7 View looking northeast from the top of the embankment to the upstream reach of Bull Run.

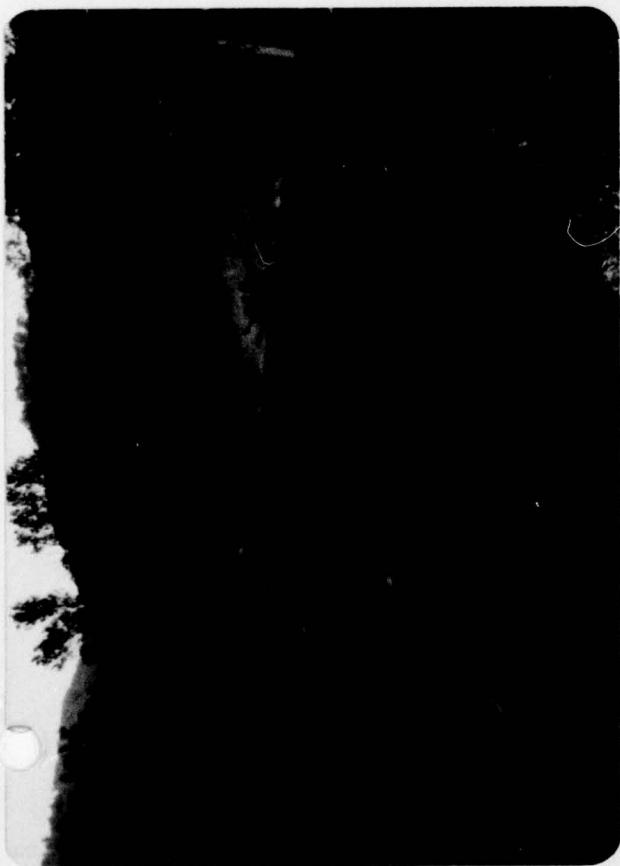
PHOTOGRAPH 8 View looking south from the top of the dam and showing the area immediately downstream of the embankment. The city of Jeannette lies in the notch between the hills just right of center in the far background. The outlet wingwall and discharge pipe lie at the toe of the slope just right of center.



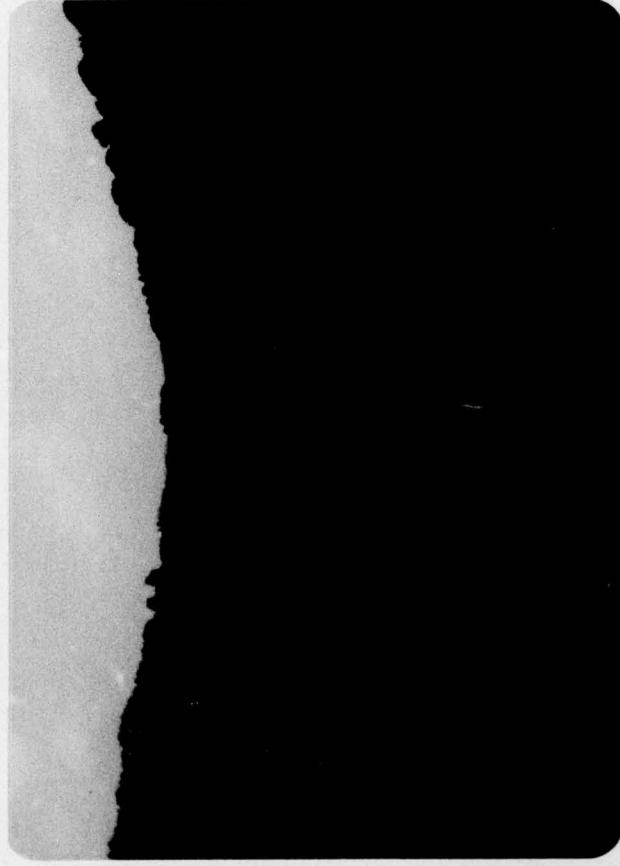
6



8



5



7

PHOTOGRAPH 9 Detail showing maple tree growing on the embankment near the forebay of the spillway. Although periodic cutting keeps the total height down, the stumps continue to increase in size as this picture shows.

PHOTOGRAPH 10 View looking northwest at the downstream slope of the embankment and the area immediately below the dam. This view is from the parking area of the industrial building shown in Photograph 8.

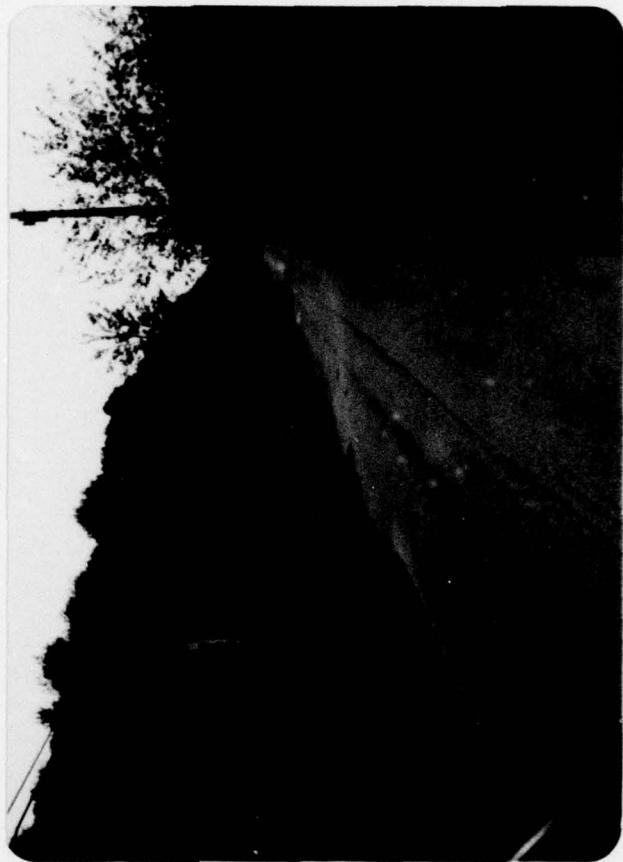
PHOTOGRAPH 11 View looking south from a point 1400 feet upstream of the dam. A full reservoir discharging over the spillway would flood the first floor level of this upstream dwelling.



10



9



11

APPENDIX E

GEOLOGY

Geology

Bull Run Dam is located within the Pittsburgh Plateaus Section of the Appalachian Plateaus Physiographic Province. The dam and reservoir area are immediately underlain by strata of the Conemaugh Formation of middle Pennsylvanian age. The strata underlying the watershed, therefore, can be expected to consist of a sedimentary sequence of rocks composed of alternating beds of sandstone, siltstone, shale and lesser amounts of limestone and coal. In the immediate vicinity of the dam site, the strata are thought to consist of the Saltsburg sandstone and underlying siltstone and shale of the lower portion of the Conemaugh. No mineable coal outcrops within the watershed, although mineable coal reportedly exists beneath the site.

Structurally, the site is situated on the west flank of the Grapeville Anticline. Consequently, the strata underlying the dam and reservoir area gently dip to the northwest at approximately 375 feet per mile or 4 degrees.

Prior to construction of the original embankment, a series of five test pits were dug in the immediate vicinity of the dam. All of the test pits were generally confined to the valley floor and ranged from 6.0 to 8.0 feet in depth. Four of the five test pits were excavated in alluvial valley fill consisting of "yellow grey and blue clay" with varying amounts of "gravel till". Test Pit No. 1 near the right abutment contained approximately 4.2 feet of "yellow and grey clay," with a "yellow clay and gravel" seam either

alluvial and/or colluvial in origin. The lowermost 2.3 feet is composed of "thin sandstone" bedrock.

In preparation for the embankment raising and outlet works rehabilitation work performed in 1957, eleven auger borings were made to determine subsurface conditions. Two borings were made at the dam site, one was drilled in the original embankment while the other was drilled immediately upstream of the original embankment. Boring 1 located on the crest of the embankment, indicates the upper 16 feet of the original embankment to be constructed of brown sandy silt with sandstone rock fragments. The upstream boring indicates 16 feet of alluvium with the uppermost six feet consisting of sandy silt with rock fragments and the lower ten feet consisting of gray, clayey silt. Beneath the alluvium, a soft black shale indicates the top of rock. nine additional auger borings were drilled in the valley flood plain upstream of the embankment in order to evaluate the borrow materials used in raising the embankment in 1957. In general, these borings indicate the top 6 to 9 feet consists of brown sandy silt often with rock fragments whereas the underlying material is composed of a uniform, gray clayey silt. The ground water level was encountered at a depth of 6 to 7 feet below the ground surface in three of the nine upstream borings.

APPENDIX F

FIGURES

TABLE OF CONTENTS

<u>Figure No.</u>	<u>Description/Title</u>
1	Field Sketch
2	Outlet Works Rehabilitation
3	Spillway General
4	Spillway Details
5	Stilling Basin and Outlet Structure
6	Plan and Profile of Dam Raising
7	Borrow Area and Borings
8	Cross Sections

SUBJECT Bull Run Dams

PL #-163

BY SGM

DATE 9-20-78

PROJ. NO. PL-501-163

CHKD. BY DLB

DATE 10-27-78

SHEET NO. 1 OF 1



Engineers • Geologists • Planners
Environmental Specialists

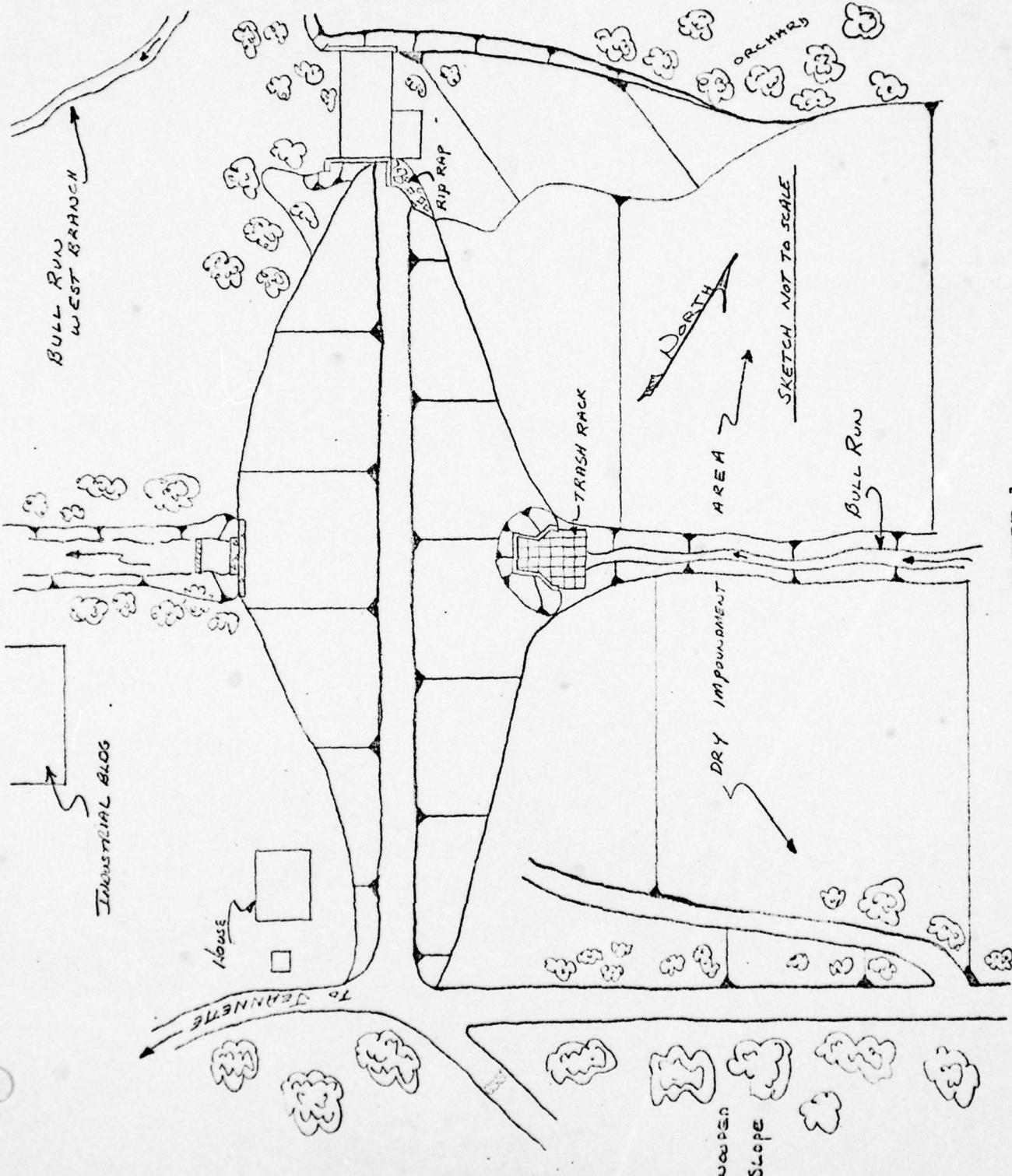


FIGURE 1

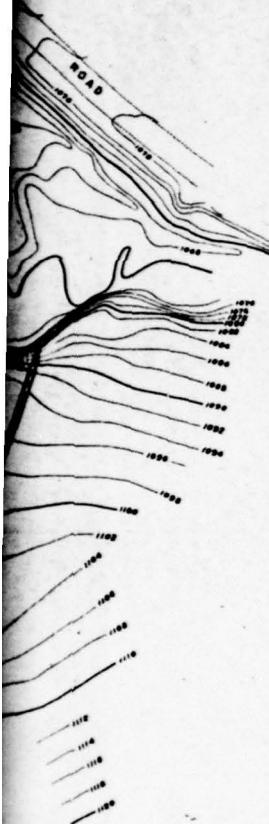
WATER :- Channel excavation to draw as directed by the engineer.

卷之三

A horizontal scale bar with markings at 0, 50, 100, and 150. Below the scale bar, the text "Scale in feet" is written.

TYPICAL SECTION

卷之三



NOTE - This sheet shows SCHEME 'A' only.
For SCHEME 'B' see drawings P.1.2B and 6.17

LOCATION

GENERAL

1. The contract for SCHEME 'A' includes:
 - Removal of existing dam
 - Construction of new dam
 - Removal of existing masonry blocks
 - Extension of reservoir to new flood control
 - Construction using new rock
 - Excavation of new rock
 - Construction of new dam
 - Excavation of new rock
2. All concrete will be replaced by alternative material.
3. All gravel will be replaced by alternative material.
4. The contract for SCHEME 'B' includes:
 - In view of the above
 - Only a part of the dam will be removed
 - Dam will be raised
5. Borrow area for SCHEME 'A' will be in the reservoir.
6. The contract for SCHEME 'B' includes:
 - and the following changes from original plans:
 - Drawing 6A has been removed
 - Drawing 6B has been changed to new dimensions related to SCHEME 'A'
 - removed from Drawings 1 and 2
 - Drawing 7 has been replaced by new one

Approved for construction

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF RIVERS AND HARBOURS
DIVISION OF FLOOD CONTROL

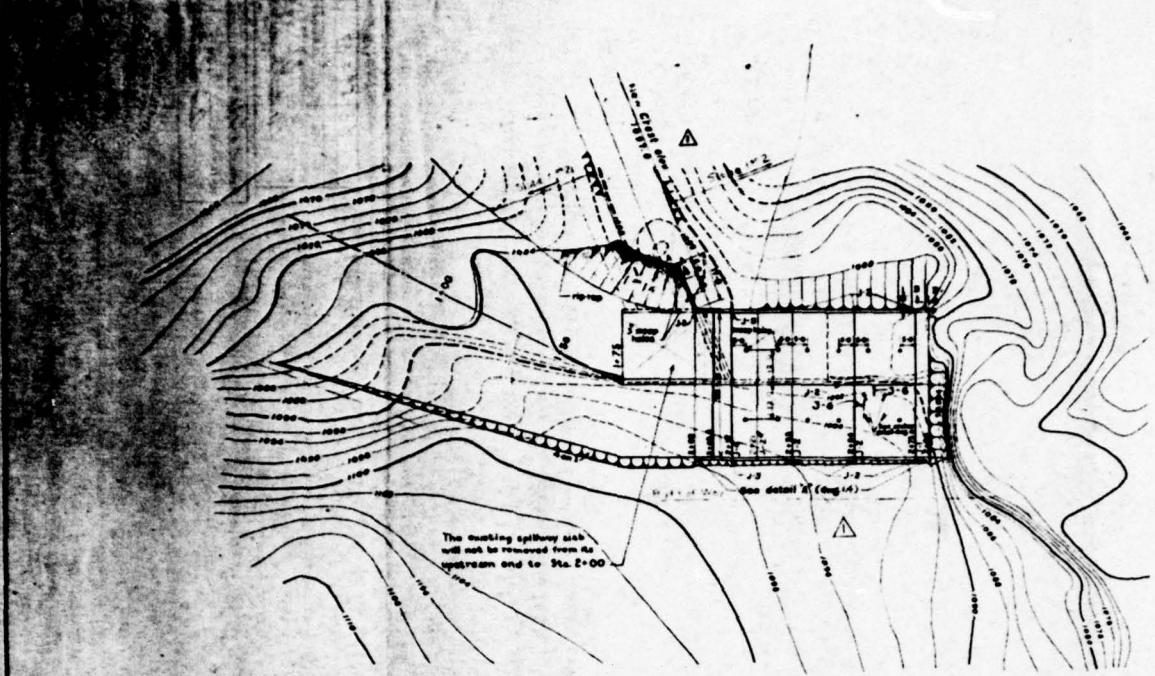
**BULL RUN DAM
OUTLET WORKS REHABILITATION
GENERAL PLAN**

BULL RUN, PENNSYLVANIA
WESTMORELAND COUNTY

FIGURE 2

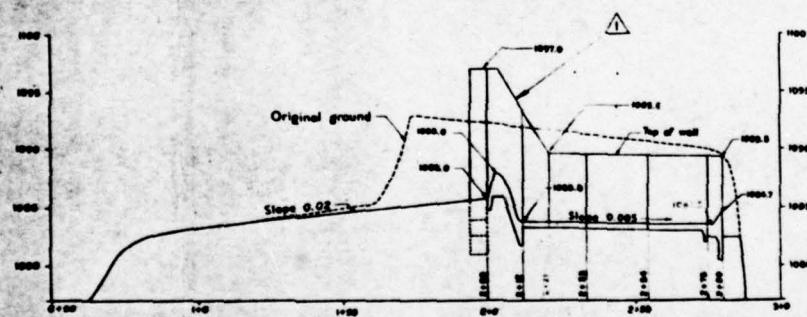
FIGURE	FILE	REVISION	DATE	REV. CURE	APPROVED
2	200	1	10/10/68	10/10/68	10/10/68

DWG. NO.



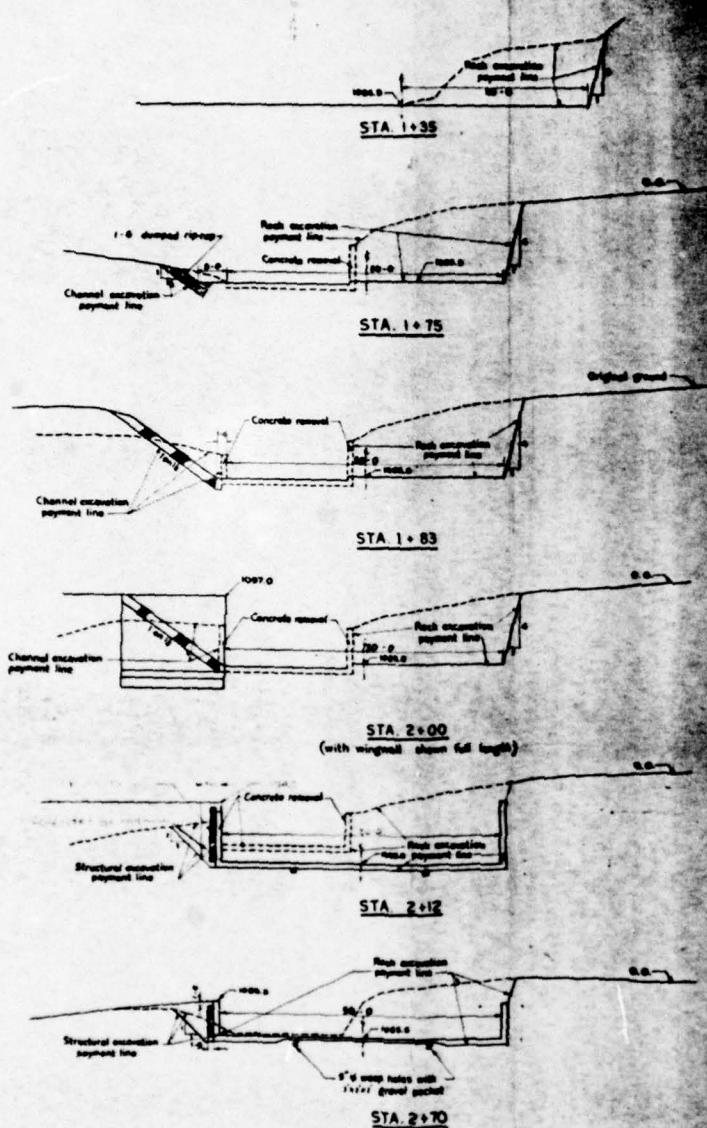
PLAN

Scale 1'-0 ft.



PROFILE

Scale vert. 1'-0 ft. hor. 1'-0 ft.
(along 4 of channel and spillway)



CROSS SECTIONS

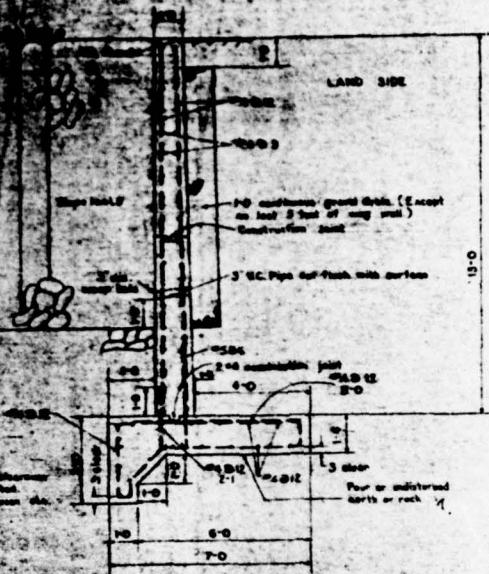
Scale vert. and hor. 1-10 ft.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF RIVERS AND HARBOURS
DIVISION OF FLOOD CONTROL
BULL RUN OUTLET WORKS
SPILLWAY GENERAL
BULL RUN
WESTMORELAND COUNTY

FIGURE 3

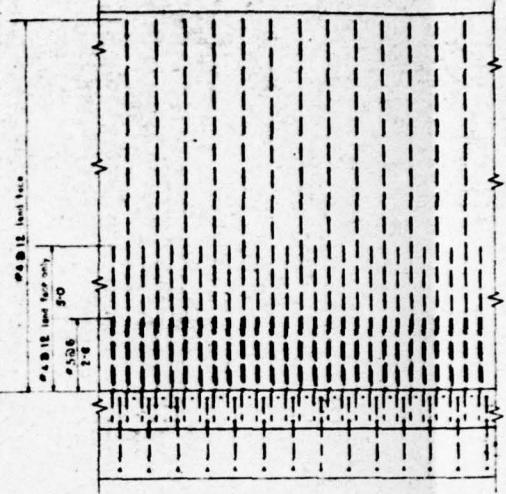
NO DATE	REVISION	REV. CEN. APPRO.	APPROVED
M. Wilson	Chief Engineer	W. A. Wilson	W. A. Wilson

DWG



SECTION A-A (See Fig No. 1-2)

Digitized by srujanika@gmail.com

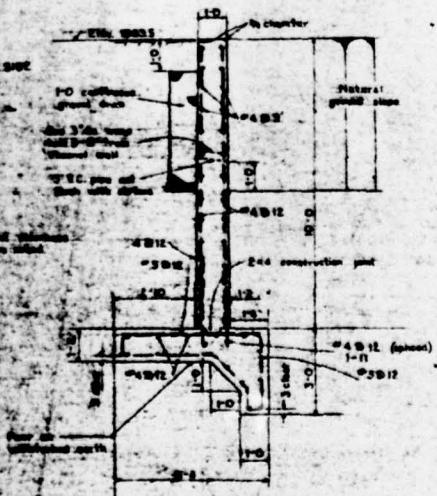


Note: Longitudinal reinforcement has been omitted.

REINFORCING DETAIL

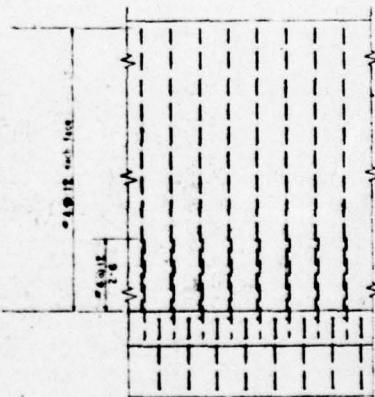
(Land Face)

Scale 1:1000

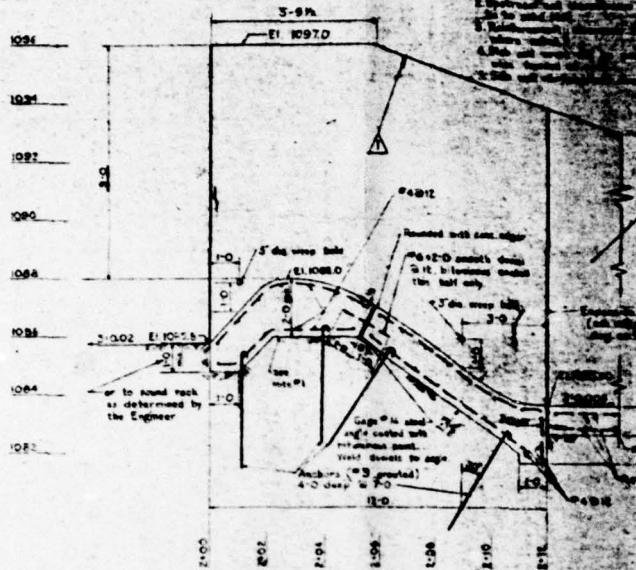


SECTION B-B (See Dwg. No. 12)

Scale 1:100



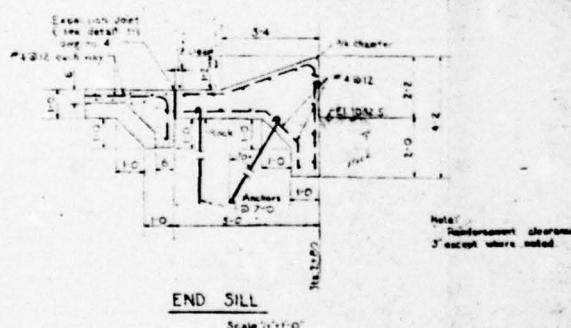
None
Longitudinal reinforcement
has been omitted



Longitudinal reinforcing
is being omitted

CREST

Scale 1/10"



END SILL

Scale 1/10"

CREST

Scale 1/10"

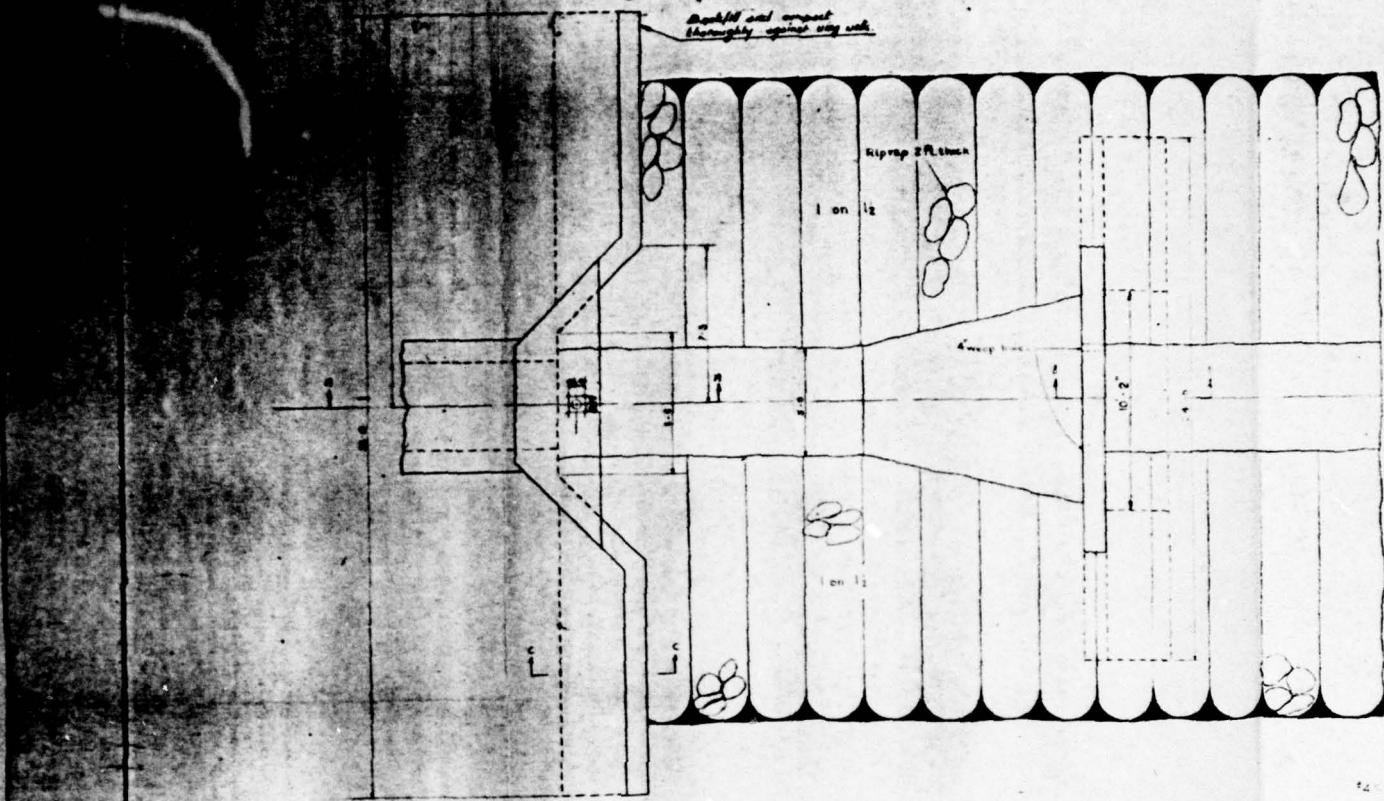
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF RIVERS AND
WATERWAYS
DIVISION OF FLOOD CONTROL

**BULL RUN DAM
OUTLET WORKS REHABILITATION
SPILLWAY - DETAIL**

BULL RUN
WESTMORELAND COUNTY

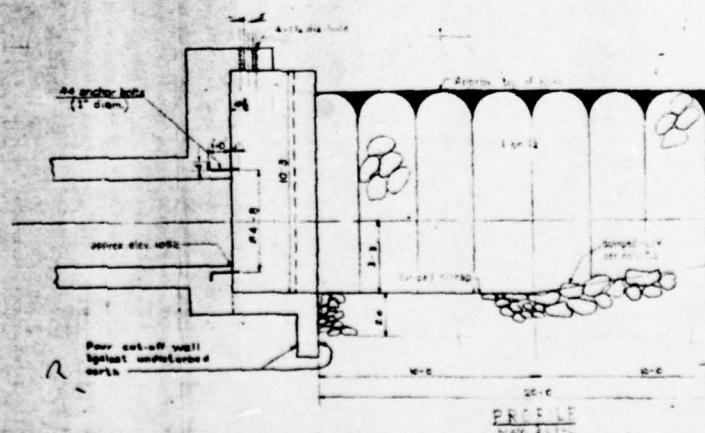
FIGURE 4

<input checked="" type="checkbox"/>	Dimensions for bid & required by contract	<input type="checkbox"/>	Not required
NO. DATE	REVISIONS	N. S. A.	REVISIONS



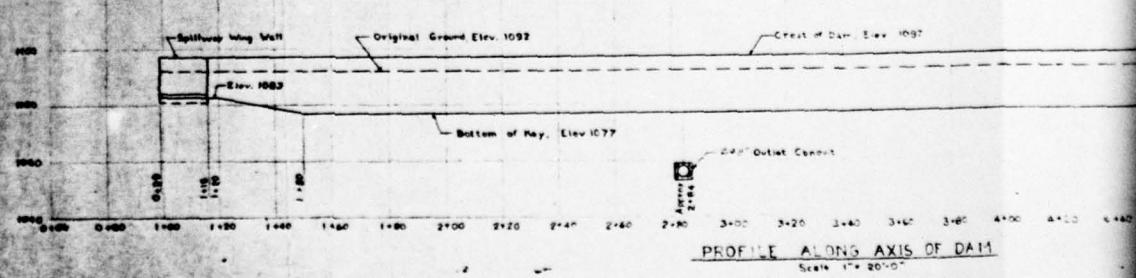
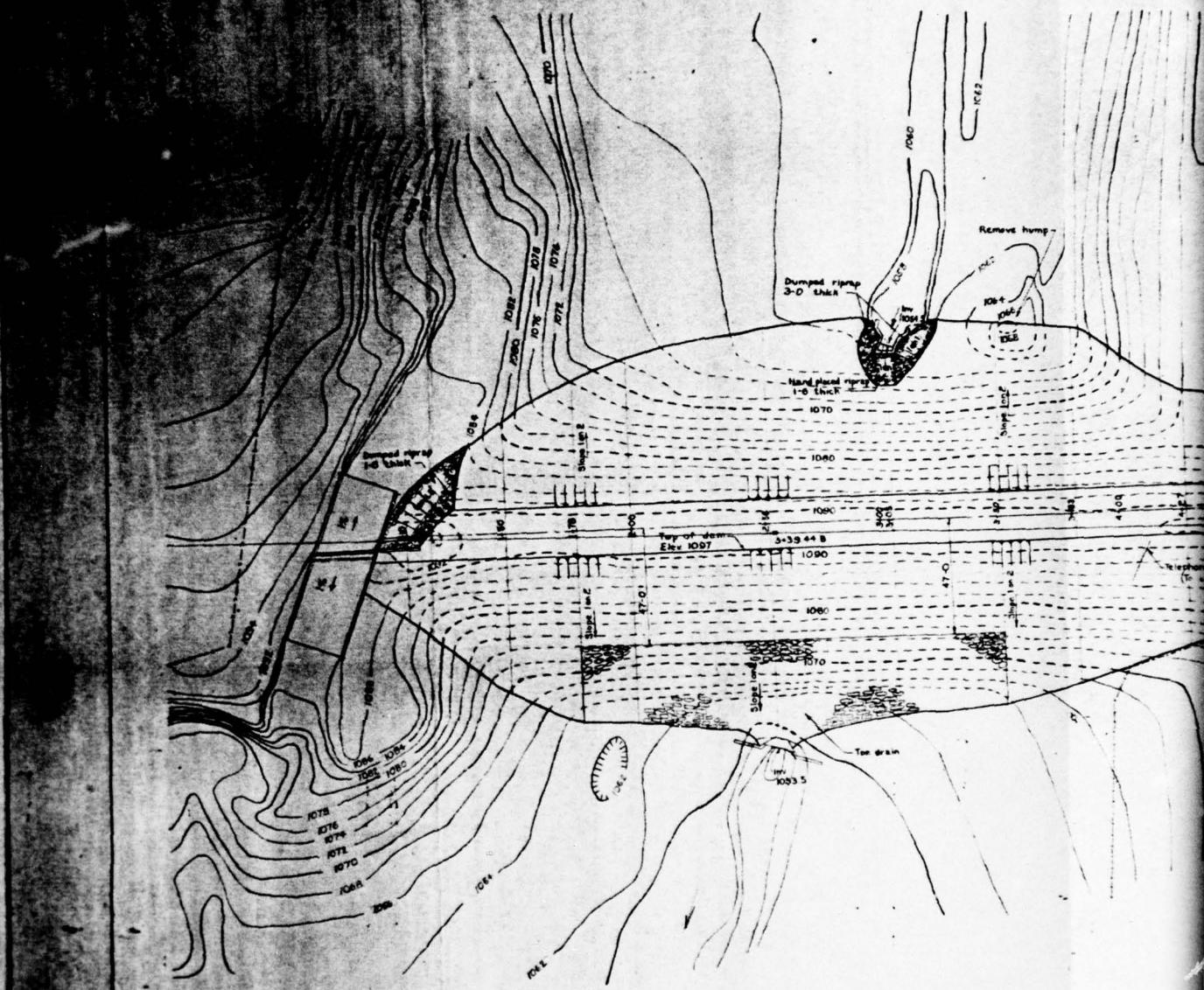
PLAN

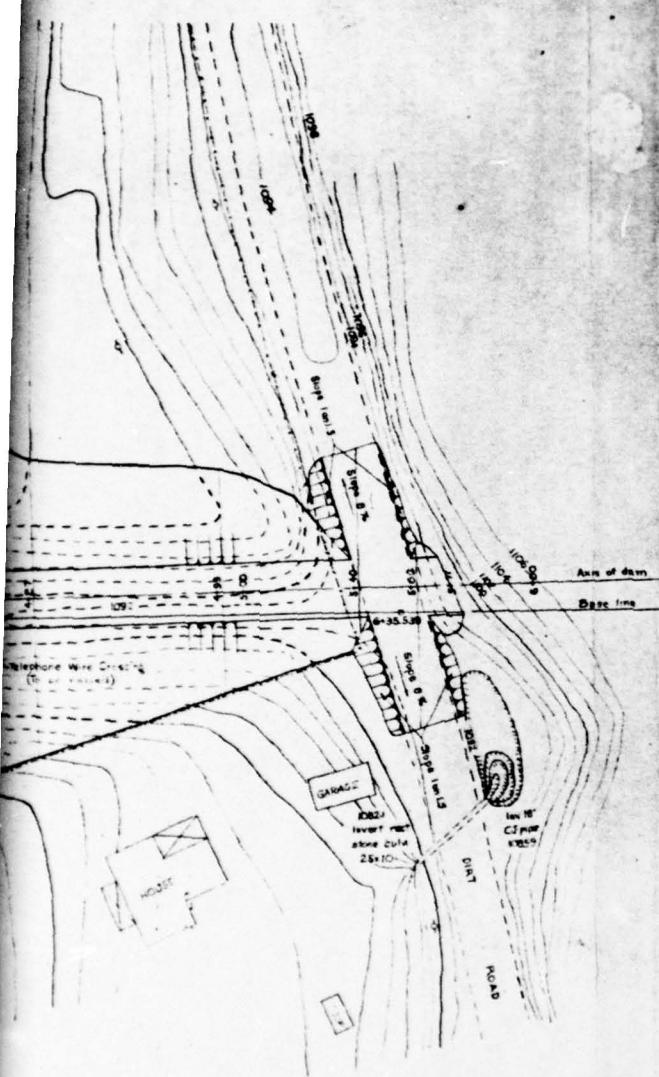
Scale 1:100



PLAN

Scale 1:100





Right Angle Offsets from Survey Base Line

From Base Line	To # Sta.	Distance
1+817 (D)	1+00	120 ft
3+3844 (D)	2+00	160 ft
8+3533 (D)	3+00	300 ft

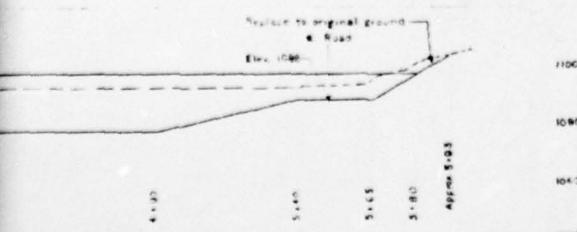


FIGURE 6

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF FORESTS AND WATERS
DIVISION OF FLOOD CONTROL

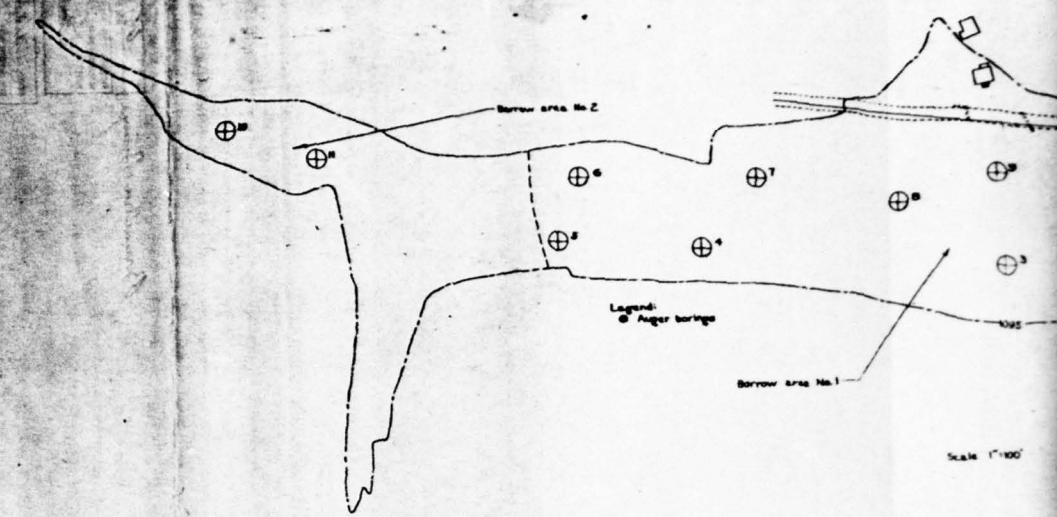
BULL RUN DAM
OUTLET WORKS REHABILITATION
PLAN & PROFILE OF DAM RAISING

BULL RUN, JEANNETTE,
WESTMORELAND COUNTY

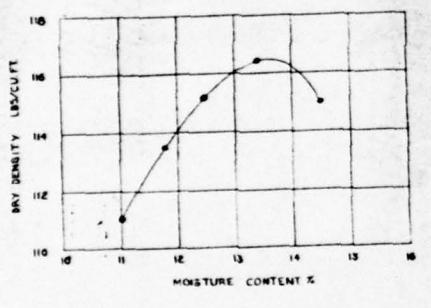
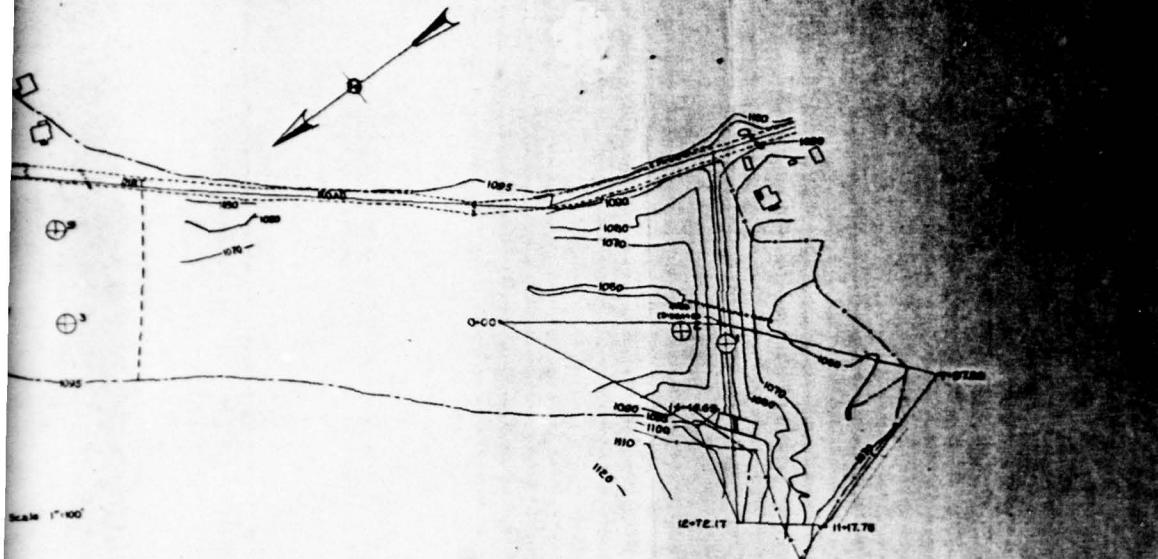
For	Miller, Cannell
use alt.	Architect
APPROVED	
REV'D	APR 1970
DATE	1970

DWG. NO. 100-1000

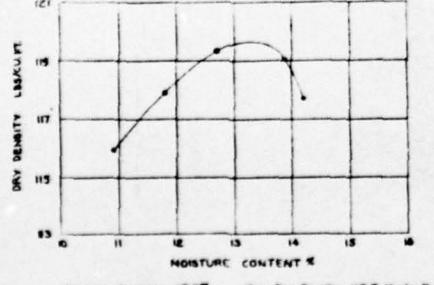
TEST BORING LOG



Ground	1	Ground	2	Ground	3	Ground	4	Ground	5	Ground	6
1	0	1	0	2	0	3	0	4	0	5	0
2	0	2	0	3	0	4	0	5	0	6	0
3	0	3	0	4	0	5	0	6	0	7	0
4	0	4	0	5	0	6	0	7	0	8	0
5	0	5	0	6	0	7	0	8	0	9	0
6	0	6	0	7	0	8	0	9	0	10	0
7	0	7	0	8	0	9	0	10	0	11	0
8	0	8	0	9	0	10	0	11	0	12	0
9	0	9	0	10	0	11	0	12	0	13	0
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11	0	11	0	12	0	13	0	14	0	15	0
12	0	12	0	13	0	14	0	15	0	16	0
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14	0	14	0	15	0	16	0	17	0	18	0
15	0	15	0	16	0	17	0	18	0	19	0
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92	0	92	0	93	0	94	0	95	0	96	0
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105	0	105	0	106	0	107	0	108	0	109	0
106	0	106	0	107	0	108	0	109	0	110	0
107	0	107	0	108	0	109	0	110	0	111	0
108	0	108	0	109	0	110	0	111	0	112	0
109	0	109	0	110	0	111	0	112	0	113	0
110	0	110	0	111	0	112	0	113	0	114	0
111	0	111	0	112	0	113	0	114	0	115	0
112	0	112	0	113	0	114	0	115	0	116	0
113	0	113	0	114	0	115	0	116	0	117	0
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117	0	117	0	118	0	119	0	120	0	121	0
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122	0	122	0	123	0	124	0	125	0	126	0
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124	0	124	0	125	0	126	0	127	0	128	0
125	0	125	0	126	0	127	0	128	0	129	0
126	0	126	0	127	0	128	0	129	0	130	0
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128	0	128	0	129	0	130	0	131	0	132	0
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130	0	130	0	131	0	132	0				

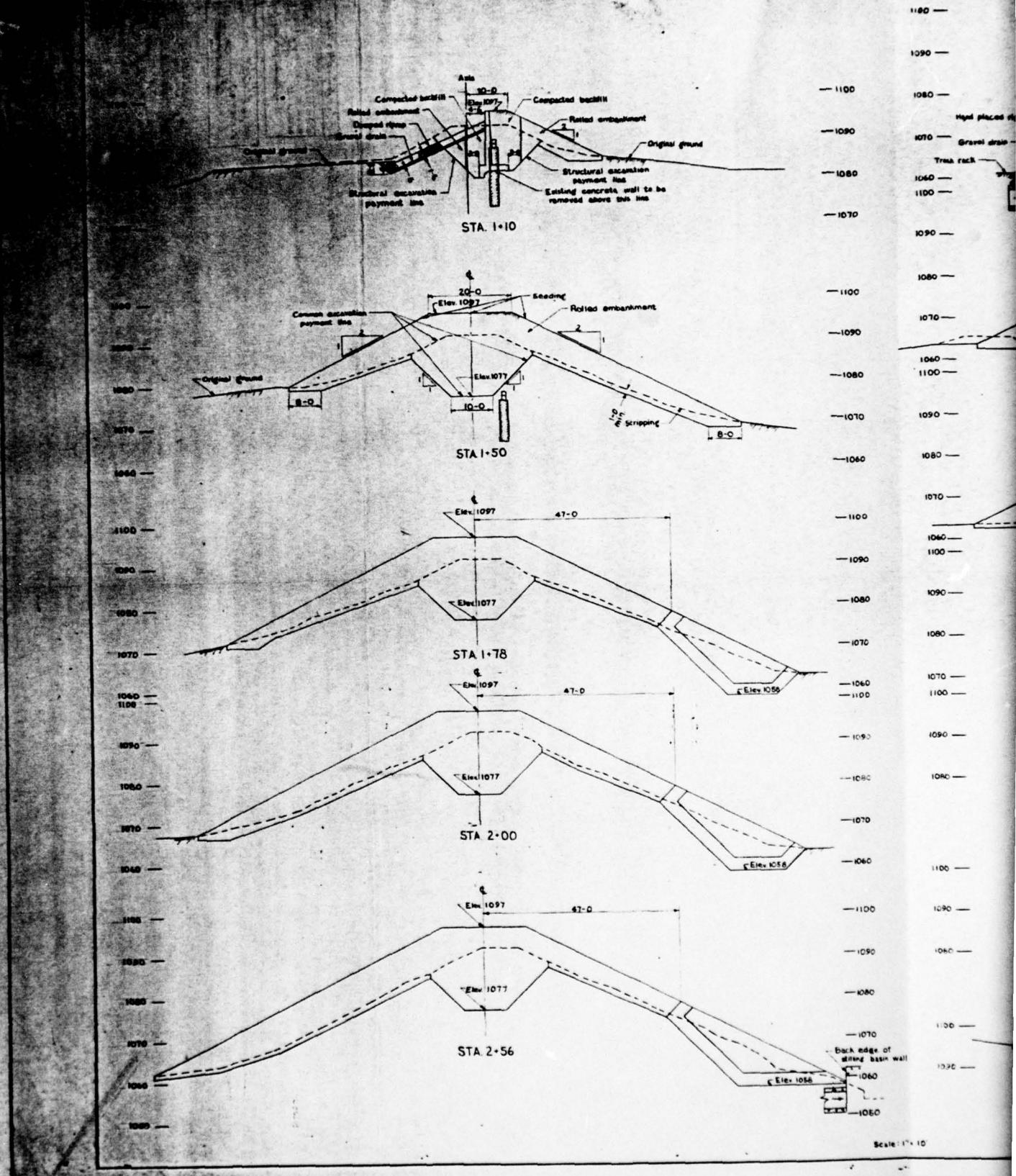


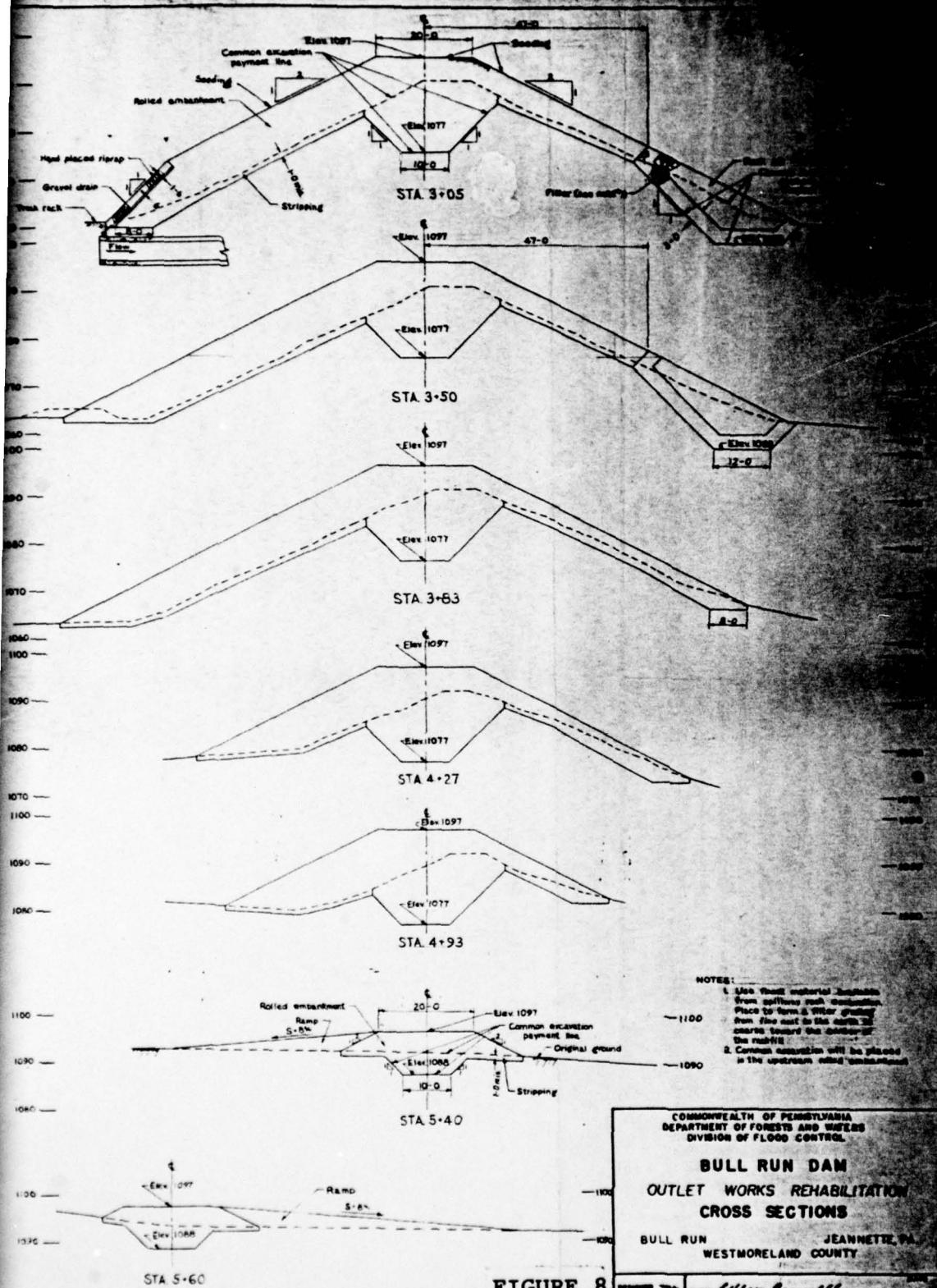
NOTE: Moisture content of borrow material during compaction shall be controlled in accordance with the specifications and kept as close as possible to the optimum moisture content as shown on this drawing.



COMMONWEALTH OF PENNSYLVANIA	
DEPARTMENT OF FORESTS AND PARKS	
DIVISION OF FORESTS	
BULL RUN DAM	
BORROW AREA AND BORING	
BULL RUN JEFFERSON	
WESTMORELAND COUNTY	
RECORDED BY:	RECORDED FOR:
J. A. [Signature]	U. S. [Signature]
DATE: 10-10-68	

FIGURE 7





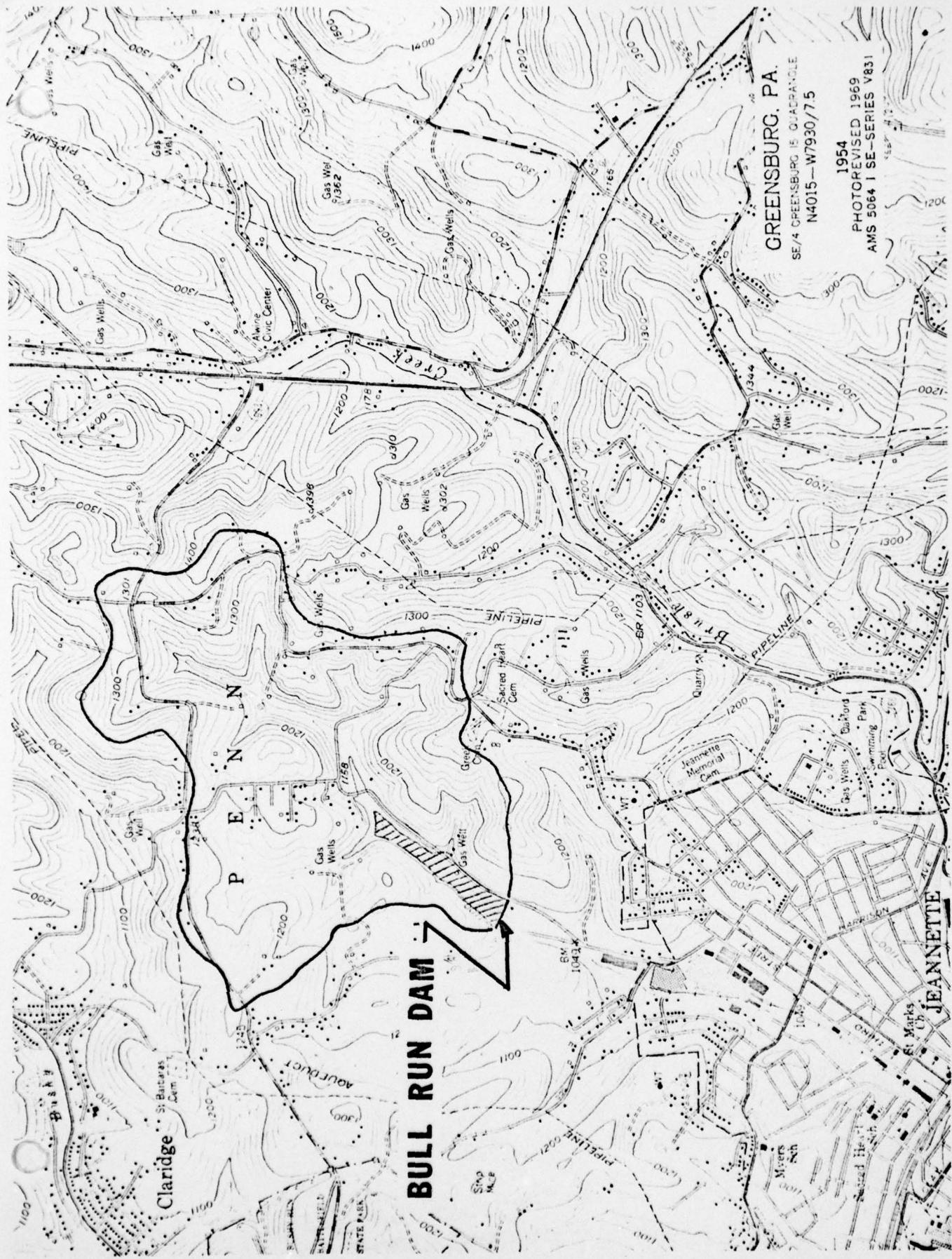
FIGURE

NO	DATE	REVISION	REV	CHE	APPR	RECOM	APPR	APPR
						1.1b	Manu K. Hall	Manu K. Hall
						Chair, Design Team	Design Team	Design Team

DWG. NO. C-6515-2

DWG. NO. C65:5-19

APPENDIX G
REGIONAL VICINITY MAP



GREENSBURG, PA.
SE 1/4 GREENSBURG IS. QUADRANGLE
N4015—W7930/75

1954
PHOTO-REVISED 1969
AMS 5064 1 SE-SERIES V831
1:250,000
1969
1:250,000